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PEANUTS IN HAWAII.

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The peanut is an annual plant. Two more or less distinct types are in general cultivation. Under Hawaiian conditions the "bunch" type grows into an erect, compact bush 8 to 24 inches high with an equal spread of foliage; the "running" or "flat" type is decumbent and spreading, rarely more than a foot high, and in some varieties attains a spread of fully 5 feet in diameter, depending on variety and cultural conditions.

The fruit is not a nut but a ripened pod with edible seeds, not unlike the pea and bean. The prominent yellow inflorescence are the male (staminate) flowers, the female (pistillate) flowers are hidden in the axils of the leaves. After fertilization has taken place the male flowers shrivel and fall away, while the female flowers rapidly develop into the rudimentary fruit on the end of an elongated stem. This soon turns downward and burrows into the ground, where it matures its so-called nuts. From experiments conducted by the Station, the peanut would seem to deserve extensive planting in Hawaii. Except for an occasional small planting made by Chinese and Japanese gardeners, very little has been done to develop it as a field crop. In the southern states the peanut is prized among the most valuable crops, combining, as it does, the desirable qualities of several important farm crops. The portion above ground makes

SHOUT
SHARE
IT

a superior hay for horses, cattle and sheep, while the underground portion yields the nuts, which, acre for acre, is said to be more nutritious than the best corn or root crop that could be grown on the same type of land. The crop may be pastured, cured as fodder, or harvested with a view to disposing of the nuts as a money crop. Being a leguminous plant, it builds up the land through its power to utilize atmospheric nitrogen. Its roots are nearly always well supplied with the nitrifying bacteria nodules, an indication that the plant is performing this valuable function. For this reason and because it is a tilled crop, which leaves the soil mellow, it is well adapted for rotation with other crops. Furthermore, the crop grows with a less amount of moisture and on lands too sandy for corn and some other of the more common Hawaiian forage crops.

Recognizing the possible value of the improved peanut to Hawaiian agriculture, this Station in 1908 imported from a leading grower in Virginia 150 pounds choice seed of the following varieties: Spanish, Bunch Jumbo, Running Jumbo, and Virginia Creeping. These are illustrated in their natural size in Plate I. The seed was widely distributed over the islands and a number of favorable reports were received showing that the peanut would thrive over a wide territory. The best results appear invariably to have been obtained on light soils with moderate moisture. Heavy soils and wet locations proved in most cases unsuited. These results have been largely confirmed in the Station experiments, although fair yields and a fair quality of nut have been obtained on the medium heavy and moist mauka lands of the Station, and under similar conditions in Kalihi and Manoa valleys on Oahu. But the nuts grown under such conditions are always more or less discolored.

The following table summarizes the results obtained by the Station in small plantings and in more extensive co-operative experiments with outside growers.

TABLE I.

SUMMARY OF YIELDS OF PEANUTS OBTAINED FROM STATION AND COOPERATIVE EXPERIMENTAL PLANTINGS FOR THE YEARS 1908, 1909, 1910.

Variety	Calculated to average acre yields			Highest Acre Yield (pounds)	Lowest Acre Yield (pounds)	Days to Maturity
	Green Weight Whole Peanut (pounds)	Cured Weight Nuts (pounds)	Cured Weight Tops (pounds)			
Spanish	10,454	1,728	1,835	3,858	564	168
Bunch Jumbo	8,961	1,881	1,950	3,225	837	158
Running Jumbo	14,439	2,077	2,256	4,729	675	158
Virginia Creeping	*	2,063	2,205	2,489	920	157
Bunch Virginia (Sport)	16,803	2,249	2,714	4,130	832	173

* Data not available, but the yields are known to about equal those of the Running Jumbo variety.

The yields of nuts are compiled from eight crops grown during various seasons covering three years, under widely different cultural conditions. The yields of green matter are taken from a single planting at the Station grounds during the present season and do not represent a high average. The yields of cured tops are an average of two crops, one very low, owing to loss of the valuable leaf portion, through weathering, and the other of a good average yield. In the Southern States the yield of peanut hay per acre frequently exceeds two tons. The highest yield recorded by this station is 3,370 pounds of cured tops from Running Jumbo planted in rows four feet apart.

These yields for the most part compare favorably with the best yields obtained in the leading peanut-growing districts of the South, notably the districts in Virginia and North Carolina, where the Station obtained its original seed.

No better proof of the adaptability of the peanut to favorable Hawaiian conditions could be given than to indicate its improvement under several years local culture. The following table gives the average number of peanuts in a pound of the select, originally imported seed stocks in comparison with the Hawaiian-grown nuts after three years' selection:

TABLE II.

AVERAGE NUMBER OF PEANUTS IN POD PER POUND.

Variety	Original seed as imported.	Hawaiian grown seed in third generation.
Spanish	759	444
Running Jumbo	345	232
Bunch Jumbo	352	226
Virginia Creeping	325	245
Bunch Virginia (sport)	.....	228

It will be noted that in all varieties there were considerably more nuts per pound in the original seed than in the Station-grown stock. This would indicate that the Hawaiian-grown seed has increased materially in weight over the imported seed. It should be further noted that this increase in weight is not due to an increase in size of the pod, but rather to larger and heavier kernels, which is of far greater importance. The well-filled pods of the several varieties of the Hawaiian-grown nut is well shown in Plate I. This is in marked contrast to the poorly-filled and frequent "pops," (empty pods), met with in the exceptionally large pods of the Jumbo varieties during our earlier experiments. In selecting for seed, growers are cautioned to avoid selecting the extra large pods, which, while they are of fine appearance, frequently bear poorly-developed ker-

nels. Well-filled pods of medium size give much better satisfaction in both yield and quality of product. Not alone are the kernels of the Hawaiian-grown nut large and heavy, but also is the tonnage yield and quality high.

The following are the average yields per plant of sound, well-matured nuts taken from a large number of select plants used for breeding purposes: Spanish, 145; Bunch Jumbo, 184; Running Jumbo, 208; Virginia Creeping, 219; and Virginia Bunch, a sport selected from among the first generation of imported Virginia Creeping, 190. Numerous selections of Virginia Creeping having yielded 250 and more sound nuts. The green weight of such plants has averaged something over 10 pounds each, and the cured pods have run about 250 seeds per pound as against 325 pods per pound of the imported stock. A single plant of the sport, Bunch Virginia, has yielded 280 nuts, weighing one pound and three ounces.

Plate II illustrates a specimen plant of each of the five varieties considered in this bulletin and gives some idea of their heavy fruiting under favorable conditions. Taken one season with another, the Virginia Bunch, Virginia Creeping and Spanish have given the most uniformly good results from Station plantings, although in one or two instances the Jumbo type appears to have out-yielded either of the other sorts.

While the Jumbo and Virginia types resemble each other very closely in habit of growth and size and shape of nuts, the Spanish type is entirely distinct. Instead of the large, rank growth of foliage, and large nuts which characterize the other varieties, the Spanish is a very much smaller and compact grower, bearing practically all its small, well-shaped and closely-filled pods in a compact cluster centered about the tap root. This is much less common in the bunch variety of either the Virginia or Jumbo type, but totally absent in the running varieties, in which the peanuts are distributed along the entire length of the recumbent stems.

In general, it may be said that the nuts of the bunch varieties are much easier harvested than in the running kinds, and

this in itself recommends the type for culture where the crop of nuts is the principal object. Being small, sweet and well flavored, the Spanish nut is preferred by confectioners. But to eat out of hand the large bunch varieties are more attractive and more sought after by the local dealers, except the Orientals, who prefer the smaller variety. The running or flat varieties, such as Running Jumbo and Virginia Creeping, while they yield prolifically a large fine nut, would seem best adapted for fodder and green manuring. Under favorable conditions they produce a large amount of vegetable matter, as is indicated in Table I, which exceeds in quantity and nutritive value almost any other crop that can be grown on light soils with an equal amount of moisture. In addition to which, both the physical and chemical conditions of the land are improved for succeeding crops of corn, cotton or grain.

PLANTING AND HARVESTING.

In addition to a thorough preparation of the land before planting, frequent shallow cultivation to suppress weeds during the earlier growth of the crop, and to keep the ground mellow, but not too loose, are very essential to the best success. A sandy or light gravelly loam seems best adapted to the full development of both nuts and vines, although a heavy growth of the latter usually results on heavier soils when well drained and tilled. Another important advantage of light soils is the avoidance of discoloring the pods which is likely to occur in dark or red soils especially when inclined towards clay and an oversupply of moisture.

The large-growing bunch varieties should be planted in rows 3 to 3½ feet apart. The running varieties require more room, 3½ to 5 feet between the rows being the best distance as indicated in our experience. The Spanish variety may be planted in rows 2 to 3 feet apart. We plant 2 seeds per running foot of row for all varieties, which has proved entirely satisfactory. It should be here noted that in the experimental plantings all test rows are placed 5 feet apart and the comparatively low

yields of the Spanish peanut shown in the table of acre yields is due to this fact; placing the rows 2½ feet apart would in most cases almost double the yield. Planting is best done by running shallow furrows at proper distances apart. A six- or eight-inch mould-board plow set to run not over 4 inches deep will answer the purpose admirably, or the drills may be made with a hoe. Drop the seed by hand and cover 1 to 3 inches deep, according to type of soil and moisture; light, dry soils requiring the deeper planting. If very mellow, the soil should be firmed above the seeds, a light roller or the feet answering the purpose well. If only a small quantity is to be planted the seed had better be shelled, as nothing but perfect kernels may then be selected. Owing to the tedious operation of shelling the nuts, in extensive plantings it may be more practical to merely break the pod in two, or they may be planted whole, in which case the germination is somewhat slower, but otherwise satisfactory if sound nuts are used. Unless several acres are to be planted, it will probably not pay to purchase a planting implement, although these are not expensive and are said to do excellent work. The ordinary corn-planter may also be adjusted to do satisfactory planting.

The young plants must be kept free from weeds and should be frequently cultivated. If a hand wheel-hoe, such as the "Planet, Jr." or the ordinary one-horse five-tooth cultivator with proper attendants, is used in season, little or no hand-hoeing will be necessary. After the plants begin to flower they should be disturbed as little as possible. Unless the season turns very dry, the vines remain a deep-green color almost up to the time of harvest and it is well to pull a vine from time to time to determine the stage of maturity. While they should not be harvested too early, permitting the nuts to remain in the ground after a certain stage, especially if the season is wet, is taking a risk of losing part of the crop through the germination of the more mature and best seed. It appears to be impossible to permit the late-maturing nuts to ripen in the ground and at the same time save those maturing early, unless the soil and season are exceptionally favorable, and no set rule can be given when

to harvest. It requires 140 to 170 days for the crop to mature under ordinary conditions. As early in the spring as the ground can be made friable is the best time for planting. As large a part of the nuts as possible should be permitted to mature under ground and then harvested with vines attached, in which condition they may be cured, either in tall slender shocks made by stringing the plants on a pole driven upright in the ground, out of doors, or hung over lines in a well-ventilated shed.

When fully cured the nuts are picked off the vines and sorted. These latter operations are the most tedious in the whole production of the crop and unless done by cheap and skillful labor may consume most of the profits. In this connection, as well as in general methods and results, the experience of the writer, who grew privately, in 1908, a third-acre of the four varieties under consideration may be of interest.

Planted in the Manoa Valley in a well-prepared virgin soil of a medium gravelly loam, which was covered with a heavy growth of guava the previous year, the crop grew luxuriantly and proved of easiest possible culture. By using select shelled seed, strong germination and a full stand were obtained. The crop was planted in July. Two seeds were planted in a hill, a foot apart, in rows 4 feet apart. This permitted of horse-cultivation up to the flowering stage, after which the crop received no further attention until harvested. The general crop matured in about 150 days, the Spanish variety matured somewhat earlier, but all varieties were dug at the same time. Harvesting was facilitated by loosening the plant with a broad-tined spading-fork thrust under the hill, which permitted pulling out the plant with practically all the nuts adhering. Calculated to acre yields, the following results were obtained: Spanish—1,965 pounds nuts, 2,550 pounds cured tops; Bunch Jumbo—1,450 pounds nuts, 2,925 pounds cured tops; Running Jumbo, 1,680 pounds nuts, 3,370 pounds cured tops; Virginia Creeping—1,760 pounds nuts, 3,150 pounds cured tops. In this experiment, the two Jumbo varieties gave the smallest yields of nuts, due to the fact that the fine large pods consisted

of a large percentage of "pops" (empty pods). Excellent as were these fields, there can be no question but that a considerably increased yield would have resulted from closer planting,—for the Spanish variety, say 2½ feet, and the other varieties 3½ feet apart. The crop sold readily at 6 cents per pound except the Spanish variety, which was sold in part at 5 cents per pound, and the balance was retained for home use in preference to any of the other varieties. The cash value of the nuts calculated to acre yields alone was as follows: Spanish, $98.00; Bunch Jumbo, $87.00; Running Jumbo, $100.80; Virginia Creeping, $105.60. The cost of production up to the time of harvest did not exceed $20.00 per acre, but the cost of stripping the nuts from the vines and sorting them afterwards amounted to almost 2 cents per pound, or an average of approximately $35.00 per acre. This makes a total cost of about $55.0 per acre to place the crop in bags ready for market. Doubtless this expense would be materially lessened with a more extended experience, especially if women and children could be employed for the lighter but more tedious work of picking and sorting the nuts. In the above estimates no credit has been allowed for the cured tops. These gave an average yield of approximately 1½ tons of cured fodder per acre. At a low estimation these should be worth $12.50 per ton, or an added value of $18.75 per acre, about the cost of producing the whole crop up to the harvest stage. Numerous reports of the profitable culture of the peanut for home use have come to the Station. The Kamehameha Girls' School recently reported harvesting 93 pounds of sound nuts, from a piece of ground 26 x 50 feet square. This is equivalent to over 3,000 pounds of nuts per acre. While the work of stripping the nuts was found the most difficult part of their culture, here as elsewhere, it was in this case overcome by student labor, a suggestion for the utilization of our large population of school youth during vacation periods. To those acquainted with wholesome and profitable employment created by the lighter work about the orchards, vineyards and hop-fields in California and elsewhere, this suggestion will not seem impracticable. One of

our prominent citizens has suggested this as a possible solution of the labor problem in picking cotton, should that industry become established in the islands, and the same service could doubtless be utilized in other ways.

USES OF THE PEANUT.

Some of the principal uses of the peanut have already been touched upon. At first thought the cash value of the nut crop might be considered of greatest importance, but in Hawaii, where the cost of nitrogenous feed-stuffs is exceptionally high, and in great demand, the fodder value of the plant, including the nuts, may prove more valuable than for any other purpose. With live hogs at 10 cents per pound, as at present, and for a decade past, there would appear to be more profit in feeding the crop to hogs than in disposing of the crop in any other way. The Alabama Experiment Station found that hogs run on peanut pasture produced a pound of pork on the following amounts of grain: Peanuts, 1.77 pounds; cow peas, 3.07 pounds; sweet potatoes, 3.13 pounds; sorghum, 3.70 pounds. The Arkansas Station reports that one-fourth of an acre planted to peanuts produced 313 pounds of pork as compared to 109 pounds from a plat of the same size planted to corn. Many other results could be quoted to show the superior feeding value, pound for pound and acre for acre, of peanuts over any other feed that can be grown where peanuts thrive. Analyses show peanut hay to have a higher feeding value than California wheat hay, and approaching that of alfalfa. In the South it is extensively fed to horses, mules, cattle and sheep, and milch cows respond to the ration, while all kinds of poultry relish both the fodder and seed. The advantages of feeding the crop on the farm are two-fold. In the first place, the large item of expense in picking and grading the nuts is eliminated, and secondly the valuable by-product, manure, is retained for further enriching the land.

As human food the peanut is constantly gaining in favor, and forms a regular article of diet in many households. Peanut

butter is a staple article of commerce and is highly recommended by many physicians. Every kitchen garden should contain a small patch of peanuts for home consumption. The soil will be left in better condition thereby than if left fallow and run over with weeds. It is one of the few crops grown by the Station not excessively attacked by insect pests.

PLATE I.

HAWAIIAN GROWN PEANUTS
(Slightly less than natural size)

1.—Running Jumbo
2.—Virginia Creeping
3.—Spanish
4.—Bunch Jumbo
5.—Virginia Bunch

PLATE II.

A.—Virginia Creeping

D —Virginia Bunch

C.- Running Jumbo

E.—Spanish

B'—Bunch Jumbo

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